The American Journal of Applied Sciences
(ISSN – 2689-0992)
Published: August 31, 2020 | **Pages:** 167-173
Doi: https://doi.org/10.37547/tajas/Volume02Issue08-24

IMPACT FACTOR
2020: 5. 276

Journal Website: http://usajournalshub.com/index,php/tajas

Study Of The Mutual Effect Of Components In The Mg (No3) 2-Hno3 · Nh2c2h4oh-H2o System

M.K. Askarova
Institute Of General And Inorganic Chemistry Of The Academy Of Sciences Of The Republic Of Uzbekistan, Tashkent

M.B. Eshpulatova
Institute Of General And Inorganic Chemistry Of The Academy Of Sciences Of The Republic Of Uzbekistan, Tashkent

G.A. Makhammatova
Institute Of General And Inorganic Chemistry Of The Academy Of Sciences Of The Republic Of Uzbekistan, Tashkent

ABSTRACT

The article presents the results of a study of the solubility of components in an aqueous system, including magnesium nitrate and a physiologically active substance, monoethanolammonium nitrate. Based on the data of binary systems and internal sections, a polythermal solubility diagram was constructed, on which the crystallization fields are delimited: ice, nine-, six-water magnesium nitrate and monoethanolammonium nitrate. It has been established that the components of this system in the studied temperature range, in the presence of joint presence, retain their individuality, and hence their physiological activity. The results obtained serve as a scientific basis for obtaining complex liquid fertilizers.

KEYWORDS

liquid fertilizers, product of nitric acid decomposition of dolomite, solubility, binary systems, internal sections, polythermal diagram of solubility, physiologically active substances.

INTRODUCTION

In recent years, the world production of mineral fertilizers has been steadily growing; the search for new compositions of liquid complex fertilizers with a wider range of properties continues. Intensive agricultural

Published: August 31, 2020 | **Pages:** 167-173
Doi: https://doi.org/10.37547/tajas/Volume02Issue08-24

IMPACT FACTOR
2020: 5. 276

production requires a wider range of fertilizers containing several nutrients.

One of the most effective methods for the production of mineral fertilizers is to obtain them in liquid form. The production of such fertilizers leads to a reduction in the number of processes and, compared to solid fertilizers, to a noticeable cost reduction.

Today, one of the important tasks is the development and improvement of technologies for obtaining new complex fertilizers based on local raw materials.

To solve this problem, it is relevant to use the products of nitric acid decomposition of dolomite (a solution of calcium and magnesium nitrates) as a feedstock, followed by its enrichment with nitrogen fertilizer components, a physiologically active substance and microelements.

Raw materials, i.e. the product of nitric acid decomposition of dolomite was obtained by us by decomposition of dolomite with a solution of nitric acid. It contains 41 ÷ 42.0% of the sum of calcium and magnesium nitrates and has the following physical and chemical properties: crystallization temperature -11.0 ° C, density 1.3961 g / cm^3, viscosity 3.013 mm^2 / s and pH 1.15. This solution can be used to obtain a complex liquid fertilizer containing both calcium nitrate and magnesium nitrate in its base.

Physiologically active substances are plant growth regulators capable of causing various changes in the process of plant growth and development in small quantities. They are strong biostimulants, that is, they increase immunity, increase germination and accelerate seed germination, reduce the negative impact of adverse external factors such as cold weather or drought, stimulate the formation of ovaries, accelerate fruit ripening, and stimulate flowering [1,2]. It has been established that the interaction of monoethanolamine with nitric acid produces monoethanolammonium nitrate of the composition 1: 1, which is a physiologically active substance [3,4,5]. To obtain a liquid fertilizer containing in its composition a physiologically active substance, monoethanolammonium nitrate, the mutual influence of one of the constituents of the product of nitric acid decomposition of dolomite, magnesium nitrate, and a physiologically active substance in the aqueous system Mg (NO3) 2-HNO3 · NH2C2H4OH-H2O was studied.

OBJECT AND RESEARCH METHODS

For the study, magnesium nitrate recrystallized from an aqueous solution, grade "pure", monoethanolammonium nitrate synthesized on the basis of nitric acid and monoethanolamine taken in a molar ratio of 1: 1 [6] were used as the initial components.

When studying the system, the visual-polythermal research method was used [7]. In quantitative chemical analysis, the well-known methods of analytical chemistry were used, in particular: magnesium was determined by the volumetric complexometric method [8]. The content of elemental nitrogen, carbon, and hydrogen was carried out according to the procedure [9].

RESULTS AND ITS DISCUSSION

The solubility of the components in the above system was studied by us for the first time by visual-polythermal methods [7]. The binary system Mg (NO3)2 - H2O was studied earlier [10]. By studying the binary system Mg (NO3) 2-H2O, we have established the presence of three branches of crystallization: ice, nine-water magnesium nitrate and six-water magnesium nitrate on its solubility diagram, the eutectic point of the binary system corresponds to a temperature of -29.00C at 32.0% magnesium nitrate ... At a temperature of -19.40C, Mg (NO3) 2 • 9H2O and Mg (NO3)

2 • $6H_2O$ precipitate into the solid phase simultaneously.

The solubility of the binary system $HNO_3 \cdot NH_2C_2H_4OH-H_2O$ was studied by us in the temperature range -20.1 to -2.00C. On the polythermal solubility diagram, two branches of crystallization are revealed: ice and monoethanolammonium nitrate. The eutectic point of the $HNO_3 \cdot NH_2C_2H_4OH-H_2O$ system corresponds to a temperature of -20.10C at 80.57% monoethanolammonium nitrate.

The Mg $(NO_3)_2$-$HNO_3 \cdot NH_2C_2H_4OH-H_2O$ system was studied by us using ten internal sections. Sections I-IV are drawn from the Mg $(NO_3)_2$-HNO_3 side to the $HNO_3 \cdot NH_2C_2H_4OH-H_2O$ top, and V-X sections from the $HNO_3 \cdot NH_2C_2H_4OH-H_2O$ side to the Mg $(NO_3)_2$ top. Based on the data on the solubility of binary systems and internal sections, projections and a polythermal diagram of the solubility of the system from the eutectic freezing point (-35.00C) to 30.00C were constructed (Fig. 1.2). The diagram shows crystallization fields: ice, nine-, six-water magnesium nitrate and monoethanolammonium nitrate. The fields converge at one triple nodal point, the characteristics of which are given in Table 1.

Isothermal lines are drawn inside the fields on the diagram of the solubility of the system every 100C. The diagram shows that the triple point corresponding to the existence of ice, magnesium nitrate and monoethanolammonium nitrate corresponds to the composition 19.9% Mg $(NO_3)_2$, 46.0% $HNO_3 \cdot NH_2C_2H_4OH$, 34.1% H_2O at a temperature of -35.00C.

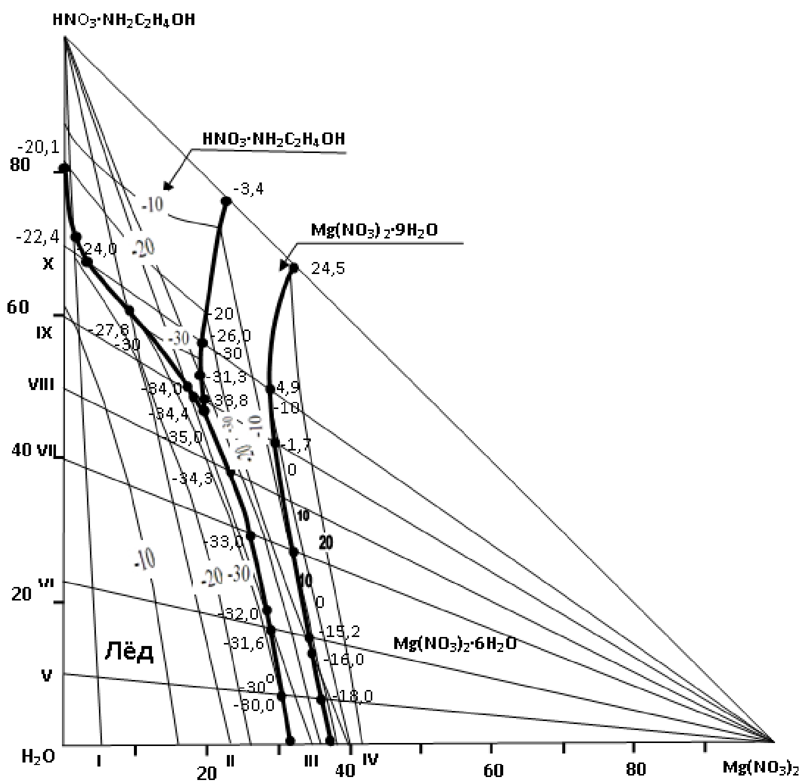

Fig. 1 Polythermal solubility diagram systems Mg $(NO_3)_2$-$HNO_3 \cdot NH_2C_2H_4OH-H_2O$

Published: August 31, 2020 | **Pages:** 167-173
Doi: https://doi.org/10.37547/tajas/Volume02Issue08-24

IMPACT FACTOR
2020: 5. 276

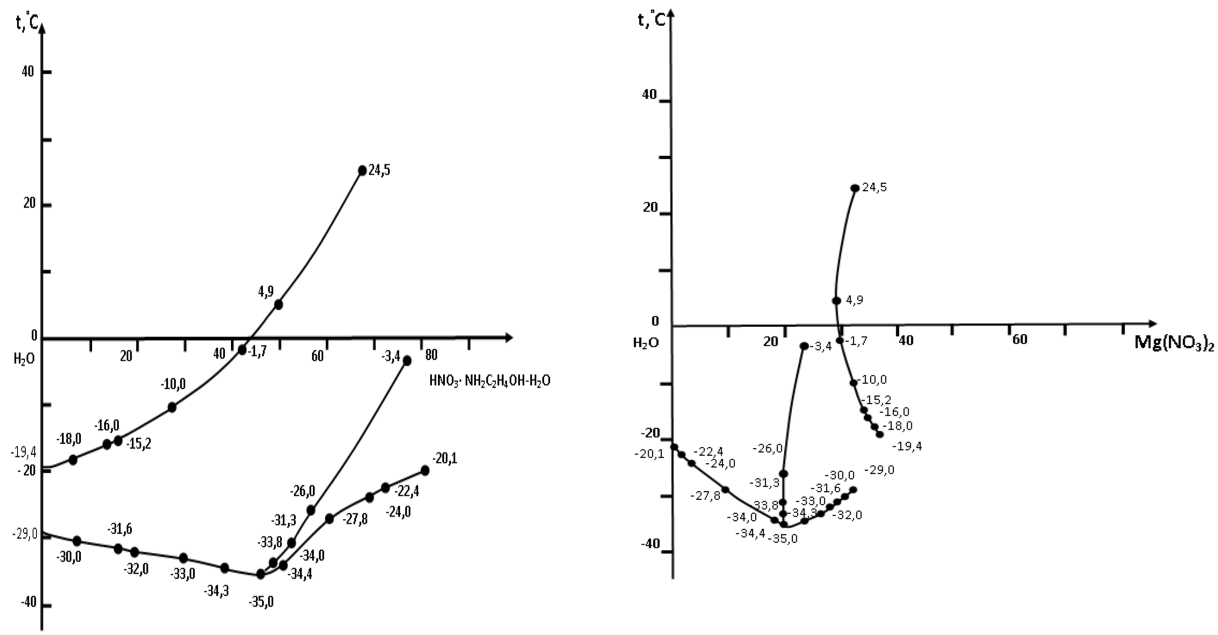

Fig. 2. Polythermic projections of the system magnesium nitrate - monoethanolammonium nitrate – water

Table 1. Double and triple points of the Mg (NO3) 2-HNO3 · NH2C2H4OH-H2O system

Liquid phase composition,%			$t_{кр}.^{0}C$	Solid phase
$Mg(NO_3)_2$	$HNO_3 \cdot NH_2C_2H_4OH$	H_2O		
1	2	3	4	5
32,0	-	68,0	-29,0	ice+ $Mg(NO_3)_2 \cdot 9H_2O$
30,8	6,9	62,3	-30,0	-//-
28,9	16,0	55,1	-31,6	-//-
28,4	18,4	53,2	-32,0	-//-

26,1	29,3	44,6	-33,0	-//-
23,5	38,0	38,5	-34,3	-//-
19,9	46,0	34,1	-35,0	ice+ $HNO_3 \cdot NH_2C_2H_4OH$+ $Mg(NO_3)_2 \cdot 9H_2O$
18,0	48,9	33,1	-34,4	ice+ $HNO_3 \cdot NH_2C_2H_4OH$
17,3	50,0	32,7	-34,0	-//-
9,0	60,7	30,3	-27,8	-//-
3,5	67,7	28,3	-24,0	-//-
1,7	70,4	27,9	-22,4	-//-
-	80,6	19,4	-20,1	-//-
19,8	48,0	32,2	-33,8	$Mg(NO_3)_2 \cdot 9H_2O$+$HNO_3 \cdot$ $NH_2C_2H_4OH$

continuation of table1

1	2	3	4	5
19,2	51,7	29,1	-31,3	$Mg(NO_3)_2 \cdot 9H_2O$+$HNO_3 \cdot$ $NH_2C_2H_4OH$
19,4	56,0	24,6	-26,0	$Mg(NO_3)_2 \cdot 9H_2O$+$HNO_3 \cdot$ $NH_2C_2H_4OH$
23,4	76,6	-	-3,4	//-
36,6	-	63,4	-19,4	$Mg(NO_3)_2 \cdot 9H_2O$+

				$Mg(NO_3)_2 \cdot 6H_2O$
6,0	6,2	57,8	-18,0	-//-
34,8	12,6	52,6	-16,0	-//-
34,4	14,8	50,8	-15,2	-//-
32,0	27,0	41,0	-10,0	-//-
29,9	42,0	27,1	-1,7	-//-
29,0	49,5	21,5	4,9	-//-
32,5	67,5		24,5	-//-

It can be seen from the data presented that the formation of new chemical compounds based on the initial components does not occur in the system under study. The system is of a simple eutonic type. Conclusion. Thus, the study of the mutual influence of the components in the Mg (NO3) 2-HNO3 · NH2C2H4OH-H2O system showed that the components of the system in the studied temperature range, in the presence of joint presence, retain their individuality, and hence their physiological activity. The results obtained can serve as a scientific basis for the development of a technology for obtaining a liquid fertilizer based on the product of nitric acid decomposition of dolomite and a physiologically active substance, monoethanolammonium nitrate.

REFERENCES

1. Muromtsev R.S. et al. Fundamentals of chemical regulation of plant growth and productivity, Moscow: 1987.
2. Nickell L. Plant growth regulators. Application in agriculture, pre. From English, M., 1984.
3. Nakhodzhaev A.Kh., Adilova M.Sh., Isakova D., Tukhtaev S. Scientific basis for the synthesis of plant growth stimulants from irrecoverable waste of primary processing of raw cotton // Materials of the international scientific-practical conference on the topic "Scientific and practical bases increasing the fertile soil ", Tashkent, July 26-27, 2007 Part 1. – pp. 353-355.
4. Saibova M.T. The use of ethanolamines in agriculture // Uzbek chemical journal. 1983. No. 1. – pp. 58-64.
5. Togasharov A.S., Askarova M.K., Tukhtaev S. Solubility polyterm of the Ca (ClO3) 2-NH2C2H4OH • HNO3-H2O system // Reports of the Academy of Sciences of Uzbekistan-Tashkent, -2015. - №6. – pp. 50-53.
6. Saibova M.T. Complex of nitrogen and nitrogen-phosphorus fertilizers with

physiologically active substances. // Dis .... doct.chem. sciences. - Tashkent, 1989. – 351 p.

7. Trunin A.S., Petrova D.G. Visual-polythermal method / Kuibyshev Polytechnic. Ins-t. -Kuibyshev .: 1977, 94 p. Dep. VINITI No. – pp. 584-78.
8. Schwarzenbarch G. Flashka G. Complexometric titration. -M .: Chemistry, 1970. – p. 360.
9. Klimova V.A. Basic micromethods for the analysis of organic compounds. M .: Chemistry, 1975. – 224 p.
10. Kirgintsev A.N., Trushnikova L.N., Lavrentyeva V.G. Solubility of inorganic substances in water. Directory. Publishing house "Chemistry", L., 1972. – pp. 152-154.